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# Caregiver Burden and Resilience Among Caregivers of Bipolar Disorder Patients: A Decision Tree Analysis

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## Abstract

# Background and aim:

Bipolar disorder is a debilitating mental illness that places significant psychological stress on family caregivers. Resilience is considered a key factor in coping with the pressures of caregiving. The aim of this study was to investigate caregiver burden and resilience in caregivers of bipolar patients using decision tree analysis.

# Method

A descriptive-analytical study with a cross-sectional design was conducted in Razi Psychiatric Hospital, Tehran. 120 primary caregivers of bipolar patients were selected by convenience sampling. Data were collected using the Caregiver Burden Questionnaire (CBI) and the Connor-Davidson Resilience Scale (CD-RISC). Decision tree analysis was performed using the CHAID and CART methods in SPSS software to identify the complex relationships between caregiver burden and resilience.

# Result

Based on CHAID decision tree analysis, caregivers with low or mild caregiving burden had higher resilience and caregivers with moderate to severe caregiving burden showed lower resilience. CART analysis showed that severe caregiving burden was higher in parents and caregivers of parents whose patient had been hospitalized more than three times had higher caregiving burden. Gender did not have a significant effect on caregiving burden.

# Conclusion

Severe caregiving burden, especially in parents caring for patients with frequent hospitalizations, leads to a significant reduction in resilience. Therefore, targeted support and educational programs are necessary to increase resilience and reduce caregiving pressure in these groups.

## Introduction

Bipolar disorder is a type of mental illness characterized by severe mood swings, behavioral changes, and difficulty regulating emotions. People with this disorder may alternate between states of deep depression and feelings of extreme happiness(1). This disease is considered one of the most debilitating disorders due to its serious complications, high recurrence rate, and high treatment costs. The importance of caring for these patients and the vital role of families in their treatment process has been widely emphasized(2, 3). The World Health Organization has also paid special attention to developing support services and increasing the role of families in caring for mentally ill patients, with the

aim of improving mental health and reducing the length of hospitalization(4). More than 60% of patients discharged from mental health facilities return home to their families and receive continued care there(5). Families, as the most important source of support, financially, emotionally, and caregiving, bear the primary responsibility for caring for these patients. However, the development of bipolar disorder in a family member has profound effects on the entire family, reducing the family's ability to cope and resist(6).

Caring for these patients usually reduces the family's energy and creates negative feelings such as hopelessness, helplessness, fatigue, and even the emergence or exacerbation of psychosomatic problems in family members, especially parents and spouses(7). These pressures are felt more strongly in those with greater caregiving responsibilities(8). Therefore, all family members, especially the primary caregiver, experience high levels of psychological stress in the caregiving process. This caregiving pressure can increase stress levels, depression, and reduce caregivers' self-esteem(9). The intensity of this stress is influenced by several factors, such as the caregivers' age and gender, the quality of their relationship with the patient, their attitudes and understanding of the illness, and the coping strategies they employ. However, caregivers with high resilience are better able to manage the stress of caregiving and maintain their own and their families' health(10).

Resilience is the ability of individuals to cope with pressures and stresses before they become harmful. Resilient behaviors help individuals to overcome problems and negative experiences and turn them into opportunities for growth and improvement. Characteristics such as flexibility, persistence, self-awareness, and a helpful spirit are among the prominent characteristics of resilience(11). Research has shown that coping skills training and resilience programs have a positive impact on patients and their caregivers. Given the key role of families in caring for bipolar patients, targeted and regular training is recommended for them(9).

Given the key role of the family in daily caregiving and the profound impact of this responsibility on the mental health and resilience of caregivers, it seems essential to accurately identify the factors affecting the management of caregiving stress. Despite the importance of the topic, few studies have used advanced data analysis methods such as decision trees to examine patterns of caregiver Burden and resilience in caregivers of bipolar patients. Using the decision tree method, which is capable of identifying complex structures and nonlinear relationships, allows for a more accurate and practical analysis of this phenomenon. In the present study, the decision tree model was used to simultaneously analyze caregiver stress and caregiver resilience, which can provide a clear model for identifying different levels of stress and resilience in this group. In addition to being simple to interpret the results, this method also has the potential to be applied in clinical settings and therapeutic decision-making. Also, paying attention to resilience as a key factor in managing caregiving pressures offers a more comprehensive approach based on caregiver empowerment, which can lead to improved quality of life for them and patients. Therefore, the aim of the present study was to analyze caregiver burden and resilience in caregivers of bipolar patients using a decision tree model in order to identify different

patterns and categories and provide more effective support and educational solutions to promote resilience and reduce caregiving stress.

## Method

# Type of study and sampling

The present study was a descriptive-analytical study with a cross-sectional design, which aimed to investigate caregiving burden and resilience in caregivers of patients with bipolar disorder. The present study was conducted at Razi Psychiatric Hospital in Tehran in accordance with the Declaration of Helsinki and all relevant institutional and national guidelines and regulations. Ethical approval was obtained from the Ethics Committee of Nishapur University of Medical Sciences (IR.NUMS.REC.1403.059). The statistical population included family caregivers of bipolar patients hospitalized in this medical center, who were selected based on the inclusion criteria. The samples were selected from among the family caregivers of the patients using convenience sampling. The sample size was determined based on statistical calculations and the power of type I test and error. 120 participants were selected from all the caregivers of the patient who met the conditions for inclusion in the study.

## Data collection tools

Demographic characteristics questionnaire: Includes indicators such as age, gender, marital status, education level, occupation, economic status, number of household members, number of affected individuals in the family, caregiver-to-patient ratio, patient's medical history, family history of the disease, and number of hospitalizations.

Caregiver Burden Inventory (CBI): This standardized instrument, designed by Zarit et al., 1985(12), consists of 22 items that are used to measure the level of stress on caregivers of mental and physical patients. The questions are scored on a five-point Likert scale from “never” to “almost always,” and the total score ranges from 0 to 88. The severity of caregiving burden is divided into four categories: no burden (0–20), mild (21–40), moderate (41–60), and severe (61–88). The reliability of this questionnaire using the test-retest method has been reported to be in the range of 0.94 to 0.96(13).

Connor-Davidson Resilience Scale (CD-RISC): This scale is a valid tool for assessing the capacity to cope with psychological pressures and threats. In this study, a 10-item version extracted from the original 25-item version was used. Questions are scored on a five-point Likert scale from "completely false" to "completely true," and the total score ranges from 0 to 40; higher scores indicate greater resilience. The validity and reliability of this scale have been proven in numerous domestic and international studies(14).

## Data collection process

After approval of the code of ethics (Ethical Code: IR.NUMS.REC.1403.059), and obtaining the necessary permits, family caregivers of bipolar patients who met the conditions for inclusion in the study were identified and after being informed, their informed consent was obtained. The questionnaires were completed either self-reported or through face-to-face interviews.

# Data analysis

The collected data were entered into Spss.v22 software and analyzed using the Decision Tree Analysis model. This method allows for the classification and categorization of caregivers based on different levels of caregiving burden and resilience, and makes complex structures and nonlinear relationships between variables visually interpretable.

## Result

The mean age of caregivers was 49.87 ± 8.49 years. Other demographic characteristics of the research sample are comprehensively presented in Table 1.

Table 1
Frequency distribution of demographic characteristics of caregivers of patients with bipolar disorder (n = 60).

| Variables | | Frequency (number) | percentage (%) |
|---|---|---|---|
| Sex | Male | 52 | 43.3 |
| | Female | 68 | 56.7 |
| Marital status | Single | 18 | 15 |
| | Married | 62 | 51.7 |
| | Divorced | 26 | 21.7 |
| | His wife died | 14 | 11.7 |
| Education | Illiterate | 6 | 5 |
| | Elementary | 6 | 5 |
| | Secondary school | 34 | 28.3 |
| | High school | 42 | 35 |
| | University | 32 | 26.7 |
| Work | Employee | 6 | 5 |
| | Retired | 3 | 2.5 |
| | Worker | 4 | 3.3 |
| | Self-employed | 57 | 47.5 |
| | Student | 1 | 0. 8 |
| | Housekeeper | 33 | 27.5 |
| | Unemployed | 16 | 13.3 |
| Family income | More than adequate | 2 | 1.7 |
| | Adequately | 55 | 45.8 |
| | Less than adequate | 63 | 52.5 |
| Home caregiver | Spouse | 14 | 11.7 |
| | Father | 40 | 33.3 |
| | Mother | 43 | 35.8 |
| | Parents | 14 | 11.7 |
| | Brother/ sister | 9 | 7.5 |

| Variables | | Frequency (number) | percentage (%) |
|---|---|---|---|
| The client's history of underlying diseases | Yes | 39 | 32.5 |
| | No | 81 | 67.5 |
| Family history of the disease | Yes | 22 | 18.3 |
| | No | 98 | 81.7 |
| Number of times the client was hospitalized | Once | 54 | 45 |
| | Twice | 42 | 35 |
| | Three times and more | 24 | 20 |

Based on decision tree analysis using the CHAID method (Fig. 1), Caregivers with no or mild caregiver burden had higher resilience, and caregivers with moderate to severe caregiver burden had lower resilience. It was observed that 57.5% of caregivers with severe caregiver burden reported a resilience score less than 16.

Based on decision tree analysis using the CART method (Fig. 1), Severe caregiving burden was higher in parents compared to other caregivers, with 42.3% of caregivers who were parents enduring severe caregiving burden. On the other hand, the third branch shows that the burden of caring for bipolar patients who had been hospitalized more than three times was severe in 54.2% of caregivers. The next sub-section showed that if the father or parents were caring for a bipolar patient who had been hospitalized more than three times, they endured more severe caregiver burden compared to mothers.

The combined findings from the decision tree suggest that intense parental caregiving stress, especially in situations where the patient has a history of repeated hospitalizations, is likely to significantly reduce their resilience. In other words, parents who bear the greatest caregiving burden are at greatest risk of reduced resilience and negative psychological outcomes (Fig. 2).

Table 2 shows that the average model prediction error over the entire sample (N = 120) is about 12.42. The value of Std. Error = 0.601 indicates the accuracy of the model prediction error estimate; a low standard error indicates that the risk estimate is relatively stable and reliable and that there is not much fluctuation in this estimate.

Table 2
Risk Estimate for Predicting Loneliness Using CART

| Measure | Estimate | Std. Error | Method | Dependent Variable |
|---|---|---|---|---|
| Risk | 12.421 | 0.601 | CART | Caregiver Burden |

# Model evaluation

The results in Table 3 show that the decision tree model (CART) had an acceptable performance in predicting different levels of loneliness in the elderly. The recall rate for the high caregiver burden group was 84.16% and for the low caregiver burden group was 83.32%. On the other hand, the precision rate in the high caregiver burden group was 93.41% and in the low caregiver burden group was 91.87%, indicating the high power of the model in correctly detecting predicted cases. The overall accuracy of the model for the high and low caregiver burden was 89.90% and 83.12%, respectively, indicating the appropriate overall power of the model in correctly predicting the dependent variable (caregiver burden).

Table 3
Classification Accuracy of the Loneliness Prediction Model

| Category | Recall Rate [a] | Precision Rate [b] | Accuracy Rate [c] |
|---|---|---|---|
| High Loneliness | 84.16% | 93.41% | 89.90% |
| Low Loneliness | 83.32% | 91.87% | 83.12% |

a. *Recall* = TP / (TP + FN), representing the percentage of actual cases correctly identified.

b. *Precision* = TP / (TP + FP), representing the proportion of predicted positives that are correct.

c. *Accuracy* = (TP + TN) / (TP + TN + FP + FN), representing the overall correctness of classification.

TP: true positive; FN: false negative.

# Discussion

The findings of this study emphasize the importance of caregiving burden and its role in determining the level of resilience of caregivers of bipolar patients. Based on CHAID decision tree analysis, caregivers with low or mild caregiving burden had significantly higher resilience than caregivers with moderate to severe burden. This result is consistent with previous research that has shown that chronic caregiver burden can reduce psychological resources and reduce individuals' coping abilities(15–18).

Zoladl et al., 2020 confirmed the negative association between caregiver burden and resilience, showing that caregivers with severe caregiving burden are more susceptible to mental fatigue and mental health disorders(19). According to the present findings, 57.5% of caregivers with severe caregiver burden had low resilience scores, indicating the severity of the impact of caregiver burden on resilience.

Furthermore, the findings of the CART decision tree analysis indicate that caring parents experience a more severe caregiving burden than other caregivers. This is consistent with similar research; A study by Smith et al., 2019 has shown that parents, especially in the role of primary caregiver, face greater stress and pressure due to their numerous emotional, financial, and time responsibilities(20). Hou et al., 2024(21), stated that parental caregivers, especially in situations where the patient has high disease severity, experience greater caregiving pressure and stress, which has a negative impact on their mental

health and resilience. The present study found that the number of hospitalizations, as an indicator of illness severity and complexity of care, had a significant impact on caregiver burden; caregivers of patients with more than three hospitalizations experienced greater caregiver burden. This finding was consistent with previous research that has linked repeated hospitalizations of psychiatric patients to increased caregiver burden and psychological distress(22). Kim et al., 2025 emphasizes that the number of hospitalizations of mentally ill patients is directly related to increased caregiving pressure and decreased caregiver resilience(23). The findings showed that among parental caregivers, fathers endure more caregiving pressure compared to mothers. This may be due to cultural differences and gender roles, as has been pointed out in studies such as García et al., 2017 study(24).

The combination of results shows that caregiving burden and patient illness severity are two key factors in reducing caregiver resilience, and accordingly, specific supportive and psychological interventions should be designed for caregivers, especially parents with severe caregiving stress. Coping skills training programs, support groups, and psychotherapy services can play an effective role in increasing resilience and reducing caregiving burden(25, 26).

Chi et al., 2024 improve the resilience of caregivers with high caregiver burden by using psychological interventions and coping skills training, which can be an effective solution for the group of caring parents(27). Fereidouni Sarijeh et al., 2025 and colleagues, who have addressed the issue of "telenursing," showed that the use of remote nursing services can reduce caregiver burden and increase their resilience(28).

The current study had limitations, including sampling at a specific treatment center with a small sample size that may reduce the validity of the results. The use of self-report data that may affect the accuracy of the results and the failure to examine other psychological and social variables that may influence resilience.

## Conclusion

The findings of the present study showed that caregiving pressure is one of the main factors affecting resilience in caregivers of bipolar patients. Parental caregivers, especially when dealing with patients who have been hospitalized more than three times, experience the highest level of caregiving pressure and consequently the lowest level of resilience. Given the high intensity of caregiving pressure in these groups and its negative impact on caregivers' mental health and quality of life, the need to plan and implement targeted support interventions to increase resilience and reduce caregiving burden is very evident.

It is recommended that future studies design and implement training programs for coping skills and resilience enhancement for caregivers, especially parents of bipolar patients. Also, utilizing interventions to provide ongoing psychological support and counseling is of great importance, especially for caregivers with a high care burden. Future studies with larger samples and examining other factors affecting caregiver burden and resilience, such as social support, physical health, and individual

characteristics, are recommended; health policies are recommended to allocate resources and support services to families of bipolar patients.

# Declarations

### Ethics approval and consent to participate

This study received ethical clearance from the Ethics Committee of Nishapur University of Medical Sciences (IR.NUMS.REC.1403.059). Written informed consent was obtained from all participants prior to their inclusion in the study.

### Consent for publication

All participants provided written informed consent for the publication of anonymized data and study findings. No identifiable personal information has been disclosed in this manuscript.

### Competing interests

The authors declare no competing interests.


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### Authors' information

Conceptualization and Study Design – A-Kh, P-F; Supervision- P-FS; Resources: Ma-E; Data collection: M.P; B.R; Data Processing- A-Kh; Analysis and/or Interpretation- P-F, Ma-E; Literature Search: B.R, Ma-E; Manuscript Writing- A-Kh, M.P; Critical Review: P-F, Ma-E.

### Data availability

The datasets generated and analyzed during the current study can be obtained from the corresponding author upon reasonable request.

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# Figures

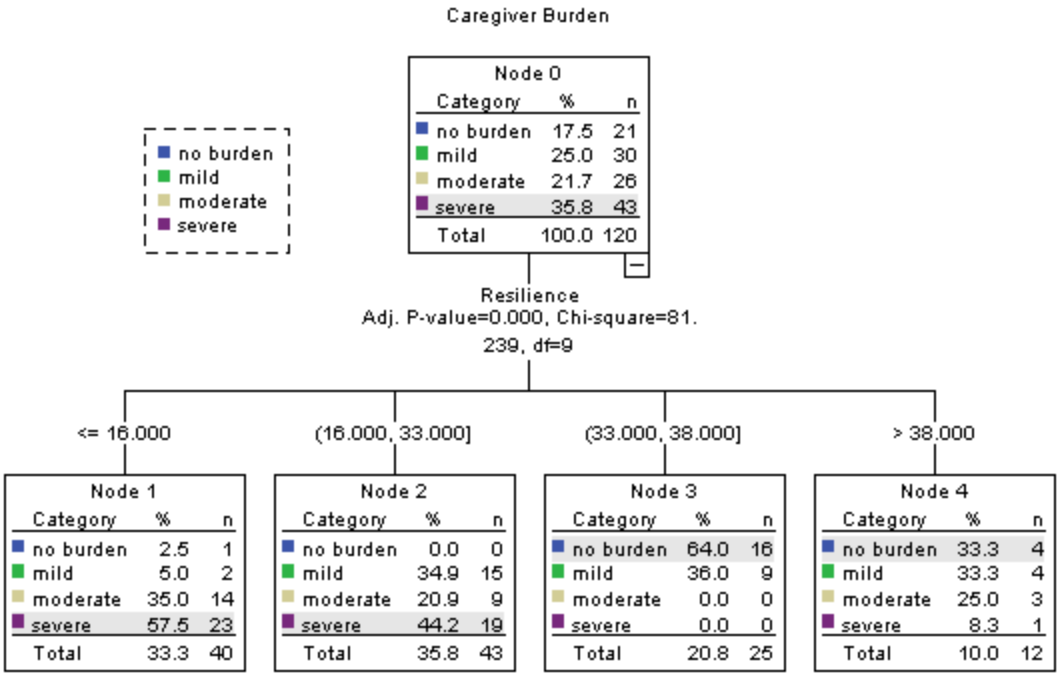
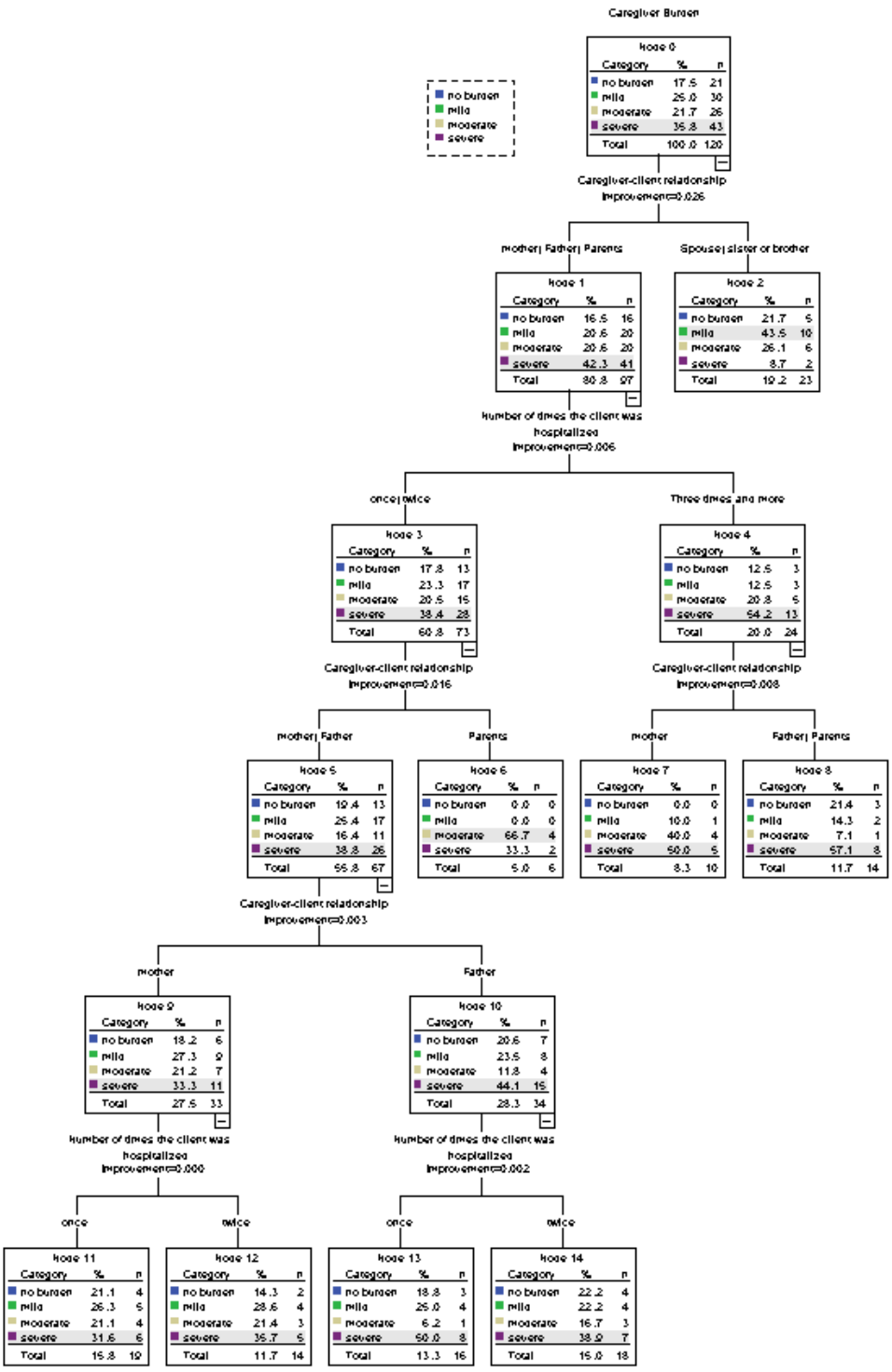



**Figure 1**

CHAID decision tree




## Figure 2

CART decision tree